Somethin' Fishy's Goin' On

This activity center is part of the Water Protection theme.

Purpose of this activity:

This activity illustrates the effects of acid precipitation on natural waterways. At this activity centre, children will gain an appreciation of acid rain and its impact on life in Haliburton and Muskoka Lakes.

Ensure that students understand the key terms **highlighted** in this activity by using them in several different contexts throughout the presentation.

Key Messages:

- Acid rain is rain, snow or fog that is polluted by acid in the atmosphere and damages the environment including the Haliburton and Muskoka lakes.
- Lakes that have high acidity levels cannot support the same variety of life as healthy lakes. As a lake becomes more acidic, crayfish and clam populations are the first to disappear, then various types of fish.
- The amount of acid in a lake is measured using a pH scale that ranges from 1 to 14. The smaller the number on the pH scale, the more acidic lake water or rain is.
- Most aquatic species do well in a pH range of 6-9.
- Acid rain is a problem in the Haliburton/Muskoka region because many of the water and soil systems lack natural alkalinity such as a lime base - and therefore cannot neutralize acid naturally.
- Alkalinity, the ability of a lake to neutralize acid, is dependent on the soil bedrock beneath – the granite bedrock of this area is less able to buffer the effects of acid rain than the bedrock in the City of Kawartha Lakes.
- While some efforts to reduce acid rain emissions have been successful the increasing use of coal fired electrical generation plants mean more acid rain and more damage to our lakes.
- Energy conservation and the use of renewable energy sources can help reduce the impact of acid rain.

Materials:

- 5 pH/alkalinity test Kits
- 5 laminated instruction sheets
- 1 laminated *Test Results* chart
- 1 *pH Scale* chart
- 1 *Impacts of Acid Rain* chart
- Milk, orange juice, water
- 5 sample bottles
- *5* washable markers/clipboards
- Display boards for 3 charts
- 1 large waste water pail
- Paper towels
- Rock samples – granite and limestone
- 1 large Rubber Maid bin
- Supply of litmus paper

What will I be doing?

You will briefly introduce students to the concept of acid rain and the pH scale. Next you will provide students with an instruction sheet on how to do a pH test and record results, supervise students as they do their test and answer any questions. When the student's results are recorded you will help the students draw conclusions. Time permitting you will do the *Bedrock Buffer Demonstration*.

1. Ask students for, or provide, a definition of acid rain and where it comes from.
2. Ask students for, or provide, a definition of pH and how acidity is measured. Show students the *pH Chart* on the display board.

3. Give each student or each pair of students a pH test kit, a water sample and instruction sheet. Make sure that water from all three sources is being tested for comparative purposes.
4. Have students follow instructions on sheet to conduct test and record results on the *Test Results* chart.
5. Inform students that most aquatic life live in waters with pH readings of 6-9.
6. Review and compare results. The sample with the lowest result has the highest level of acidity. Explain to students that the impact of acid rain on lakes is greater in this area than lakes further south in Ontario. **Ask if they know why**.
7. Explain what alkalinity is and how the bedrock under the lake can affect the ability of the lake to reduce the impact of acid rain. Use a stomach anti-acid analogy.
8. Time permitting, have students do alkalinity test and record results on the *Test Results Chart* on display board.
9. Review and compare results. What sample has the greatest ability to reduce the impacts of acid rain? The answer is - the higher number indicates a greater ability to neutralize acids and will be the water from the lake that has limestone bedrock beneath.

SUMMARIZING QUESTIONS

1. Can aquatic life live in the water that has been tested? (Any reading below 6 has an impact on aquatic life.)

2. Is the rain sampled a threat to lakes and aquatic life in Haliburton and Muskoka? What types of life are threatened? Refer to *Impacts of Acid Rain* chart on display board.

3. List some industries that cause acid rain to form, and what are industries that help reduce acid rain? (Coal factories, Hydro-electric stations, etc.)

4. What does it mean for something to have a high pH and a low pH? Give an example of each.

Background Information:

Two common air pollutants acidify rain: sulphur dioxide (SO_2) and nitrogen oxide (NO_X). When these substances are released into the atmosphere, they can be carried over long distances by prevailing winds before returning to earth as acidic rain, snow, fog or dust. Areas such as Muskoka-Haliburton and Quebec City receive about three-quarters of their acid deposition from the United States. Rain SO_2 is generally a by-product of industrial processes and burning of fossil fuels. Ore smelting, coal-fired power generators and natural gas processing are the main contributors. The main source of NO_X emissions is the combustion of fuels in motor vehicles, residential and commercial furnaces, industrial and electrical-utility boilers and engines, and other equipment.

On the pH scale, the smaller the number on the pH scale, the more acidic the substance is. Small number changes on the pH scale actually mean large changes in acidity. For example, a change in just one unit from pH 6.0 to pH 5.0 would indicate a tenfold increase in acidity. Clean rain usually has a pH of 5.6. It is slightly acidic because of carbon dioxide that is naturally present in the atmosphere.

Clean Up Procedures:

- Clean up and organize kits
- Put kits, instructions and all other equipment in large Rubber Maid bin
- Put display board and charts under shelter if necessary. If new supplies are needed, tell someone with a blue shirt.